Fuhrländer Wind Turbine Overview

2004 Wind Diesel Workshop

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Alyeska Resort, Girdwood, AK

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Fuhrländer Mid-Sized Wind Turbines for Wind-Diesel Applications

Fuhrländer FL 250 at Harbec Plastics in Ontario, New York

- "Danish Design"
  - 3 bladed upwind wind turbine design
  - Active Yaw
  - Dual wound two speed generator
  - Stall regulated <600kW
  - Aerodynamic tip brakes
- Available in Multiple Sizes 30kW - 600kW
- Cold Climate Option
- New, Built to Order

Examples of Fuhrländer Wind Turbines for Wind-Diesel Applications

Fuhrländer FL 30

Facility or Small Village System
30,000 - 90,000 kWh/yr
30 meter lattice or tubular tower
3 Phase / 480 VAC
Typical $130,000 cost ($4.33 /W)

Fuhrländer FL 250

Facility or Medium Village
350,000 – 750,000 kWh/ yr
40-50 meter tower
3 phase / 480 VAC
Typical $490,000 cost ($1.98 /W)

Fuhrländer FL 100

Facility or Medium Village
150,000 – 300,000 kWh/ yr
35 meter tower
3 phase / 480 VAC
Typical $380,000 cost ($3.80 /W)

Fuhrländer FL 600

Large Facility or Village
1.0 – 1.8 million kWh/yr
50-75 meter tower
3 phase / 690 VAC
Typical $925,000 cost ($1.55 /W)

Advantages of Fuhrländer Wind Turbines

- Overall System Design
  - “Danish Design” dominates the industry
- Manufacturing Philosophy
  - Company recognizes importance of distributed generation and wind diesel applications
- Industry Certified
  - Factory ISO 9001, Wind Turbines TÜV, GL
- State of the Art
  - New Wind Turbines
  - Advanced controller
  - Remote monitoring, control, remote factory upgrades

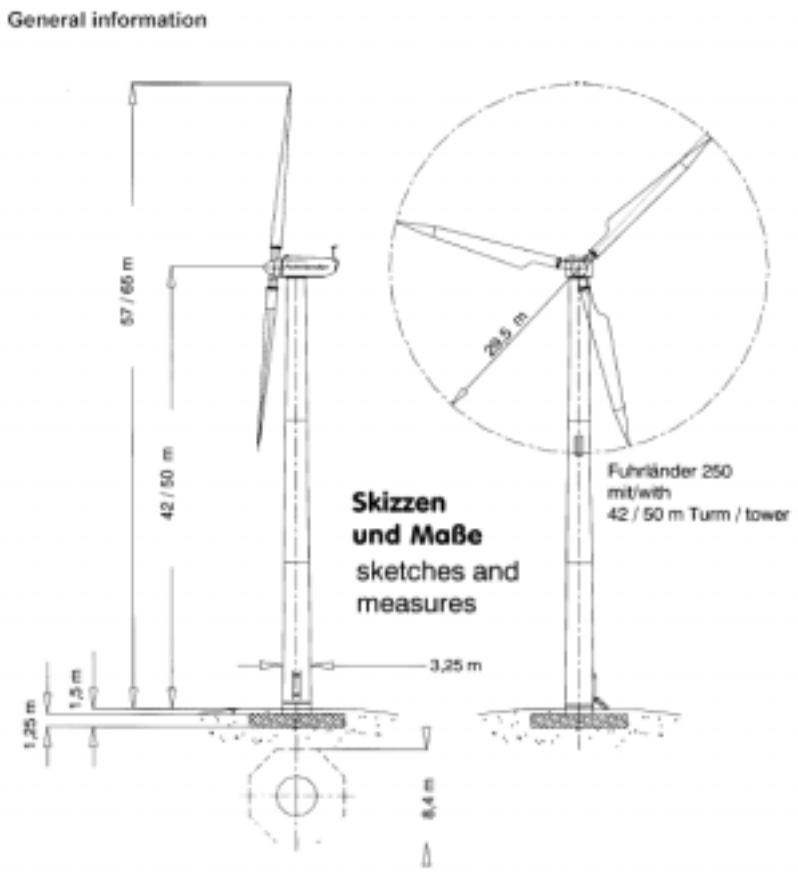
Advantages of Fuhrländer Wind Turbines

- Standardization across Product Sizes
  - Components, controllers, software
- Cold Climate Option (-40 Degrees)
  - Special steel for blades, drive train, tower
  - Low temperature fasteners
  - Drive train monitored, heated if necessary
  - Heated anemometers, vanes
  - Heated controller, switchgear
  - Enclosed towers, nacelle

Advantages of Fuhrländer Wind Turbines

- Freewheeling Rotor
  - Turns at a slower speed when wind is below “cut-in”
  - Keeps drive train lubed and warm
- Availability
  - Each Model is in regular production
  - Tubular towers built in Seattle for Alaskan Market
- Competitive
  - FL 250 provides “Best Value” at facilities and villages which have the infrastructure needed to install one.

Prospective Wind Power Project Used to Demonstrate Typical Economics



Simulated Photo of FL 250 at Seafood Plant

Prospective Mid-Size Wind Power Project Used to Show Savings by Turbine Size

Wind Tubine Simple Payback Analysis, by Size					
	20 Year Averages	30 kW	100 kW	250 kW	600 kW
[1]	Capital Cost of Wind Turbine Generator	$130,000	$385,000	$525,000	$925,000
[2]	Annual System Power Generation (kWh)	60,444	201,480	503,700	1,208,880
[3]	Annual Power Displaced from Electric Company	$13,499	$44,998	$112,494	$269,986
[4]	Annual Operating Costs for Wind Turbine	-$3,900	-$11,550	-$15,750	-$27,750
[5]	Annual System Savings [3]+[4]-[5]	$17,399	$56,548	$128,244	$297,736
[6]	Simple Payback (Years) [1]/[5]	7.5	6.8	4.1	3.1
[7]	20 Year Power Generated Cost ($/kWh)	$0.172	$0.153	$0.083	$0.061
NOTES:					
[1]	Capital cost is estimated from best case installation.				
[2]	Annual Power Generation is calculated using a 23% capacity factor.				
[3]	Annual Electric power costs calculated using a $.15 cost increasing at 4% a year				
[4]	Annual operating costs are estimated to be 2.5 percent of capital (1.5% for FL 600)				

In Summary:

- **Lorax Energy Systems Provides Fuhrländer Wind Turbines as a "ready to order" solution for Wind Diesel Applications**
  - Technologically Appropriate
  - Available
  - Competitive
  - Choice of Wind Diesel Integrators
  - Thousands of Successful Examples World Wide

Mid-Sized Wind Turbine Resources

- American Wind Energy Association
  - www.awea.org
- Wind Powering America
  - www.eren.doe.gov/windpoweringamerica/
- US DOE National Wind Technology Center
  - www.nrel.gov/wind
- Danish Wind Industry Page
  - www.windpower.dk
- TDX Power
  - www.tdxpower.com
- Sustainable Automation
  - www.sustainableautomation.com/
- Powercorp Alaska, LLC
  - www.pcorp.com.au
- Northern Power Systems
  - www.northernpower.com